Chapter 7

Noise and Vibration

7.1 Introduction

This chapter describes the noise and vibration impacts on humans and structures that could result from construction and operation of each of the build alternatives. The sections that follow describe the noise and vibration study area, the methods used to analyze the impacts, the affected environment, and the impacts of noise and vibration associated with the build alternatives. The regulations and guidance related to noise and vibration are summarized in Section 7.6, *Applicable Regulations*. Appendix H, *Noise and Vibration Impact Assessment*, provides further information on the analysis methods. The contribution of the proposed rail line to cumulative impacts on noise is discussed in Chapter 18, *Cumulative Impacts*.

In summary, noise impacts from construction would be comparable for all build alternatives and would not exceed regulatory thresholds except at one receptor location on the Ashland East Alternative, if pile driving were to occur at night. The Colstrip Alternative would result in the most adverse[1] noise impacts from rail operation, which would exceed OEA analysis thresholds at 89 receptors on the existing Colstrip Subdivision and at five receptors on the new rail line under the high coal production scenario.[2] The Decker East Alternative would result in the fewest noise impacts, which would not exceed thresholds at any receptor locations and would not be adverse. OEA concludes that construction-related adverse noise impacts would be moderate but temporary. Operation-related adverse impacts along the Colstrip Subdivision would be moderate.

Vibration associated with operation and construction would not exceed regulatory thresholds.

7.2 Study Area

OEA defined the study area for noise and vibration as the area within 2 miles of the right-of-way for each build alternative (see Figures 2-1 through 2-5 in Chapter 2, *Proposed Action and Alternatives*, for maps of the project area). This study area encompasses all potential noise-sensitive receptors.

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[1] The term *adverse* is used to describe a noise impact that exceeds Surface Transportation Board noise thresholds, as described in Section 7.3, *Analysis Methods.*

[2] The coal production scenarios (low, medium, high) reflect different levels of rail traffic, depending on which build alternative is licensed, which mines are induced or developed, and the production capacities of those mines. The coal traffic scenarios are described in Appendix C, *Coal Production and Markets.* The related rail traffic is summarized in Chapter 2, Section 2.3.3, *Rail Traffic*.

7.3 Analysis Methods

The Board's environmental regulations (49 Code of Federal Regulations [C.F.R.] Part 1105.7) include two specific thresholds for noise analysis (49 C.F.R. Part 1105.7e(6)) as follows.

- An increase in noise exposure as measured by a *day-night average noise level*[3] (DNL) of 3 A-weighted decibels (dBA) or more.
- An increase to a noise level of 65 DNL or more.

OEA used the methods described in the following subsections to evaluate the noise and vibration impacts of construction and operation of each build alternatives. Specifically, OEA used these methods to determine if railroad noise levels (*wayside noise* and locomotive warning horns) for any build alternative would result in a 3 dBA or greater increase in noise levels or would equal or exceed 65 DNL. OEA also assessed whether or if vibration would cause impacts. Appendix H, *Noise and Vibration Impact Assessment*, provides the equations and further describes these methods.

If the estimated increased noise level at a location exceeded either of the thresholds for noise, OEA identified (using aerial photographs) and counted the number of affected noise-sensitive receptors (such as residences, schools, libraries, retirement communities, churches, and nursing homes) and quantified the noise increase. OEA implemented the thresholds separately to determine an upper bound of the area of potential noise impact. Noise research indicates that both thresholds must be met or exceeded to cause an adverse noise impact (Surface Transportation Board 1998a, Coate 1999). That is, noise levels would have to be equal to or greater than 65 DNL *and* increase by 3 dBA or more to result in an adverse noise impact.

7.3.1 Noise Contours and Baselines

OEA used an internationally accepted environmental noise computer program (Computer-Aided Noise Abatement or CadnaA) and wayside and horn reference levels from previous studies to generate *noise contours,* which are delineated on a map to show the DNL values. The overall noise model results are sensitive to horn noise, locomotive and rail car noise, train length, and train speed. OEA based wayside noise estimates on information compiled for previous OEA analyses (Surface Board of Transportation 1998a, 1998b) and used data on horn noise compiled by the Federal Railroad Administration (FRA) (1999). OEA used these particular sources because the noise measurement databases are large and result in statistical reliability.

OEA incorporated digital terrain modeling as part of the advanced noise modeling techniques, using 3-meter U.S. Geological Survey topographic contours. Because much of

[3] Terms italicized at first use are defined in Chapter 25, *Glossary*.

the terrain in the study area is hilly, the shielding effects[4] of topography are an important aspect of modeling for this study area.

OEA estimated noise exposure (expressed as DNL) that would result from rail line operation using plans and information on distances and noise propagation paths to all sensitive receptors identified in the study area. OEA estimated noise exposure that would result from construction in terms of *equivalent sound level* (L_{eq}).

To establish a baseline for determining the 3 dBA increase contours, OEA measured ambient sound levels at a subset of receptors in the study area.

7.3.2 Noise-Sensitive Receptors

OEA counted the number of noise-sensitive receptors within the 65 DNL noise contours or the 3 dBA increase contours using advanced noise modeling techniques, digital aerial photographs, and geographic information systems (GIS) software.

7.3.3 Vibration

OEA analyzed vibration impacts using published vibration data for freight trains and construction equipment and on Federal Transit Administration (FTA) methods (Federal Transit Administration 2006).

7.4 Affected Environment

The existing environmental conditions related to noise and vibrations in the study area are described below.

Ambient sound levels vary within the study area but are generally higher in populated areas than in unpopulated areas. In areas with low ambient sound levels, rail noise could be more noticeable than in areas with higher ambient sound levels. Ambient sound levels are higher in the populated areas of Colstrip and Ashland and in areas near roadways, such as Tongue River Road.

OEA measured ambient sound levels at 15 locations near receptors throughout the study area. OEA took measurements for 24 hours at each measurement location between July 30, 2013, and August 4, 2013. OEA used the following criteria to select monitoring locations.

- Buildings that met OEA's definition of sensitive receptors.
- Proximity of receptors to each build alternative.
- Geographic coverage of each build alternative.

[4] Large obstacles such as hills or intervening terrain between a receptor and train noise source can cause acoustic shielding resulting in reduced noise levels. For example, if the line-of-sight between a noise source and receptor were completely blocked by an obstacle, a 5 dBA or more reduction in noise level would result.

OEA conducted ambient sound monitoring in locations where land access permission from landowners was obtained. The results of the monitoring are shown in Table 7-1. The locations and samples of ambient noise monitoring were more than sufficient to characterize ambient sound levels accurately in the study area. OEA conducted statistical analysis of the measurement data, which showed that the data are adequate for accurately establishing long-term ambient sound levels in the study area. The 15 monitoring locations consisted of 12 residences, two schools, and one church. The noise monitoring locations are shown in the noise contour figures in Appendix H, *Noise and Vibration Impact Assessment*.

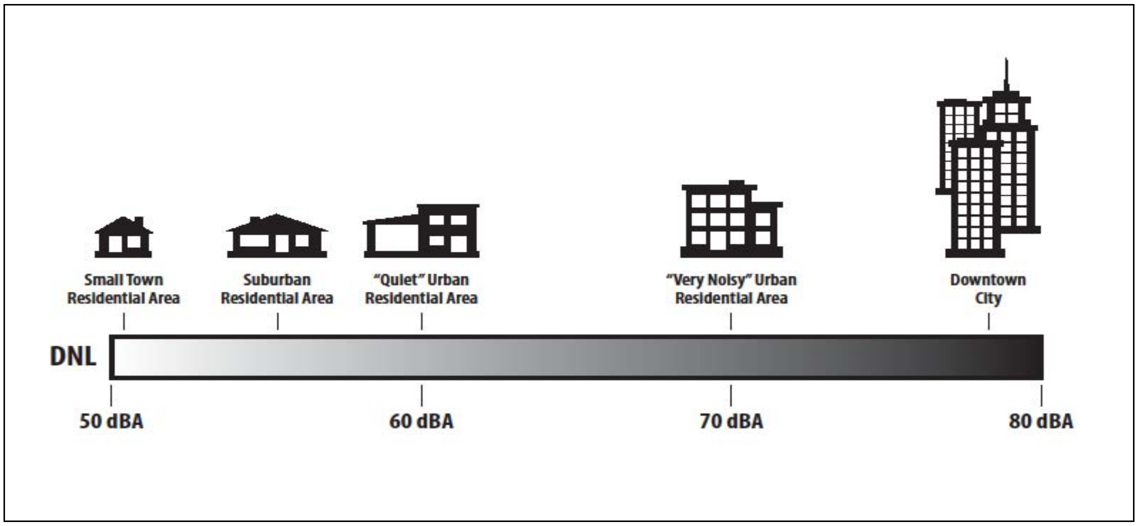
Table 7-1. Measured Ambient Sound Levels in the Study Area

Primary Build Alternative or Variation	Locator/ Receptor Type	Figure[a]	Latitude/Longitude	DNL (dBA)
Tongue River Road	1: Residence	H6	441372, 5117557	44
Tongue River Road	1: Residence	H7	437350, 5108263	45
Tongue River	3: Residence	H8	432019, 5103932	46
Tongue River Road	4: Residence	H10	425031, 5097928	45
Colstrip	5: Church	H29	372897, 5086341	46
Tongue River	6: Residence	H15	403758, 5077789	47
Colstrip	7: Residence	H17	398628, 5062159	48
Tongue River	8: Residence	H18	400369, 5054245	42
Tongue River	9: Residence	H19	398094, 5045012	40
Ashland East	10: Residence	H21	406623, 5042144	43
Decker	11: Residence	H65	387559, 5031306	45
Decker	12: School	H64	381293, 5019811	43
Decker	13: Residence	H62	370676, 5013547	40
Decker	14: Residence	H60	363838, 5002559	45
Decker	15: School	H59	357693, 4996475	39

Notes:
[a] Figures are in Appendix H, *Noise and Vibration Impact Assessment*
DNL = day-night average noise level; dBA = A=weighted decibel

All ambient sound levels measured in the study area were within the U.S. Environmental Protection Agency's small-town residential area range of noise levels (Figure 7-1[5]).

Figure 7-1. Typical Day-Night Average Noise Levels (U.S. Environmental Protection Agency 1974)



7.5 Environmental Consequences

Noise and vibration impacts could result from construction and operation of any build alternative. Noise and vibration impacts would be common to all build alternatives, although the magnitude of such impacts would vary because of factors such as proximity to receptors and shielding effects of topography. The impacts common to all build alternatives are presented first, followed by impacts specific to the build alternatives.

7.5.1 Impacts Common to All Build Alternatives

7.5.1.1 Construction

OEA used the FTA general assessment method (2006) to evaluate noise impacts from rail construction. This method is used when the details of the construction schedule are not specified. Using this method, the two noisiest pieces of general construction equipment are identified and assumed to operate simultaneously. Table 7-2 shows the two pieces of general construction equipment assumed to be noisiest (heavy truck and bulldozer), corresponding noise levels, and combined noise level. Table 7-2 also shows the noise level for an impact pile driver, the noisiest piece of specialized construction equipment, which is analyzed separately because it would be used only in certain applications, such as bridge construction. OEA then estimated the combined noise level for general construction equipment at the

[5] This figure shows ranges of typical ambient sound levels (DNL) for communities ranging from small-town residential to a downtown city. Ambient sound levels typically are a function of population density, and include corresponding transportation noise sources.

receptor nearest each segment and compared the noise level with the assessment criteria in Table 7-3. These criteria establish the noise levels above which there could be an adverse community reaction (Federal Transit Administration 2006). Construction noise criteria typically employ higher allowable noise levels than operation, to take into account the temporary nature of construction.

Table 7-2. Construction Equipment Noise Levels

Equipment	Noise Level at 50 Feet (dBA)
Heavy truck	88
Bulldozer	85
Heavy truck and bulldozer combined	90
Pile driver (impact type)	101

Notes:
Source: Federal Transit Administration 2006
dBA = A-weighted decibels

Table 7-3. Federal Transit Administration Construction Noise Criteria

Land Use	Daytime 1-hour L_{eq} (dBA)	Nighttime 1-hour L_{eq} (dBA)
Residential	90	80
Commercial	100	100
Industrial	100	100

Notes:
Source: Federal Transit Administration 2006
L_{eq} = equivalent sound level; dBA = A-weighted decibels

In addition, OEA identified representative vibration-producing construction equipment and, based on FTA data, estimated corresponding vibration levels at the nearest receptors. OEA selected a bulldozer for this analysis because it is commonly used for rail construction projects and it produces relatively high vibration levels.

There are two types of impacts from rail-related ground vibration: annoyance to humans and damage to buildings. Each type is evaluated using a different measure: *peak particle velocity* (PPV) for building damage and root-mean square vibration velocity (VdB) for human annoyance. Building damage thresholds are much higher than human annoyance thresholds. Because ground-borne vibration levels generated by trains are typically relatively low, even cosmetic building damage is rare. These different measures are discussed in Appendix H, *Noise and Vibration Impact Assessment*.

Table 7-4 presents estimated general construction (combined) noise levels and bulldozer vibration levels by rail line segment. As shown, the estimated construction noise levels would be below the FTA criteria (Table 7-3); therefore, no adverse community reaction would be expected. Estimated vibration levels from construction activity would be below the

FTA fragile building damage criterion[6] of 0.20 inch per second PPV (Federal Transit Administration 2006), so no building damage due to vibration from rail construction is anticipated. Vibration due to construction might be perceptible in some locations, but the frequency of vibration events would be low (and temporary) and below fragile building damage criteria.

Table 7-4. Estimated Construction Noise and Vibration Levels

Primary Build Alternative or Variation	Distance to Nearest Receptor (feet)	Bulldozer Vibration (PPV in inches per second)	General Construction (combined) Noise Level (dBA)
Tongue River	184	0.004467	78
Colstrip	407	0.001356	72
Tongue River Road	318	0.001960	74
Moon Creek	856	0.000444	65
Decker	545	0.000875	69
Decker East[a]	–	–	–
Ashland East	249	0.002826	76

Notes:
[a] There are no receptors near this segment
PPV = peak particle velocity; dBA = A-weighted decibels

For the purpose of this analysis, OEA assumed that pile driving would occur during construction of bridges over water bodies or at rail/roadway crossings. The precise location and method of bridge construction would be based on final engineering and design. OEA estimated potential pile-driving noise and vibration levels at the nearest receptors for proposed bridge locations (Chapter 2, Section 2.2.8, *Bridges, Culverts, and Other Surface Water Crossings*). Table 7-5 shows the estimated noise and vibration levels at bridge locations, which are shown in Figures 7-2 through 7-11. These noise and vibration levels assume impact pile driving. However, use of other techniques, such as vibratory or sonic pile driving, could result in lower noise and vibration levels.

[6] FTA delineates categories of building types, ranging from robust construction to fragile and extremely fragile historic buildings. The fragile building damage criterion is often used conservatively to assess the possibility of vibration-induced damage in residential areas.

Table 7-5. Estimated Pile-Driving Noise and Vibration Levels at Proposed Bridge Locations

Primary Build Alternative or Variation	River Crossing	Distance to Nearest Receptor (feet)	Pile-Driving Vibration PPV (inches per second)	Pile-Driving Noise Level (dBA)
Tongue River	Tongue River	2,592	0.0014	67
Tongue River	Otter Creek	919	0.0068	76
Colstrip	Rosebud Creek	1,430	0.0035	72
Colstrip	Lay Creek	9,154	0.0002	56
Colstrip	Tongue River	1,306	0.0040	73
Tongue River Road	Tongue River	2,339	0.0017	68
Tongue River Road	Ash Creek	1,594	0.0030	71
Tongue River Road	Foster Creek	745	0.0093	78
Tongue River Road	Lay Creek	12,139	0.0001	53
Tongue River Road	Liscom Creek	2,559	0.0015	67
Tongue River Road	Beaver Creek	1,818	0.0024	70
Moon Creek	Moon Creek	7,123	0.0003	58
Moon Creek	Moon Creek	2,740	0.0013	66
Decker	Tongue River	1,791	0.0025	70
Ashland East	Tongue River	1,490	0.0033	72
Ashland East	Otter Creek	515	0.0162	81

Notes:
PPV = peak particle velocity; dBA = A-weighted decibels

Estimated vibration levels from pile-driving activity at all locations would be below the FTA fragile building damage criterion of 0.20 inch per second, so no building damage due to vibration from pile driving is anticipated. Estimated pile-driving noise levels would be temporary and below the FTA criteria shown in Table 7-3, except for bridge construction at Ashland East/Otter Creek if pile driving were to occur at night, which may occur if TRRC adopts a schedule that includes construction during the winter months. According to TRRC, around-the-clock, year-round construction may be considered if project economics and market conditions dictate. Around-the-clock construction would be required for winter grading activities to prevent deep freeze from setting in to the embankment.

7.5.1.2 Operation

Noise Contours

Railroad operation noise is composed of diesel locomotive engine and wheel/rail noise (collectively referred to as wayside noise) as well as locomotive warning horns sounding at at-grade rail/roadway crossings. Wayside noise is primarily a function of train speed, train length, and number of locomotives. Per information provided by TRRC, the noise analysis is based on trains consisting of four locomotives with 125 rail cars.[7] Each of the four

[7] In its October 16, 2012 revised application, TRRC stated that the proposed railroad would be designed to accommodate coal trains of 150 freight cars but that the actual train size will be determined by destination. On February 6, 201,3 in response to the

locomotives would be 75 feet long, rail cars would be 53 feet long, and the overall train length would be approximately 6,925 feet. Maximum operating speed of the trains would be 40 miles per hour (Tongue River Railroad Company 2013).

OEA analyzed three levels of train traffic based on the coal production scenarios described in Appendix C, *Coal Production and Markets*. The high production scenario represents 19[8] train *passbys* per day (a passby is a noise event at a receptor, which could occur at any time during a 24-hour period) for the Tongue River Alternatives, Colstrip Alternatives, Tongue River Road Alternatives, and Moon Creek Alternatives and 27[9] train passbys per day for the Decker Alternatives. The medium production scenario represents 11.9 train passbys per day for all build alternatives. The low production scenario represents 7.4 train passbys per day for all build alternatives.

Based on these assumptions, Table 7-6 shows the distances to the 65 DNL (i.e., from the Board's environmental regulations) contour lines for train traffic under the high, medium, and low production scenarios (horn and wayside noise). Beyond these distances from the proposed rail line, train-related noise levels would be less than 65 DNL. The computer-generated noise contour distances can vary substantially from these values because of the shielding effects of topography and other factors such as curved sections of track. Depending on the exact track geometry, curved sections can focus sound on a particular area, thus increasing the noise contour distances.

Table 7-6. 65 DNL Noise Contour Distances (feet)

	Production Scenario		
Build Alternative	**Low**	**Medium**	**High**
Colstrip, Tongue River Road, Moon Creek Horn Noise Contour Distance	517	710	969
Colstrip, Tongue River Road, and Moon Creek Wayside Noise Contour Distance	236	324	443
Decker Horn Noise Contour Distance	517	710	1,225
Decker Wayside Noise Contour Distance	236	324	560

first STB information request, TRRC used 125 cars in its calculation of the number of trains per day. Additionally, on May 29, 2014 in response to STB's fifth information request BNSF stated that the average coal train moving on BNSF's northern corridor would generally have 125 cars if moving westbound to the Pacific Northwest and 118 cars if moving eastbound to the upper Midwest. OEA chose to use 125 cars per train for the analysis in this EIS because this value is common to applicant-supplied information. It is conservative because it matches the upper bound of current operations.

[8] Nineteen trains per day is the maximum amount of rail traffic estimated for any of the Tongue River Alternatives, Colstrip Alternatives, Tongue River Road Alternatives, and Moon Creek Alternatives (northern alternatives). This is based on OEA's estimate of maximum production from the proposed Otter Creek Mine (34 million tons per year) and the potentially induced Poker Jim Creek–O'Dell Creek coal deposit (16 million tons per year) (Appendix C, *Coal Production and Markets*).

[9] Twenty-seven trains per day is the maximum amount of rail traffic estimated for either of the Decker Alternatives (southern alternatives). This is based on OEA's estimate of maximum production from the proposed Otter Creek Mine (34 million tons per year) and the potentially induced Poker Jim Creek–O'Dell Creek (16 million tons per year) and Canyon Creek (22 million tons per year) coal deposits (Appendix C, *Coal Production and Markets*).

Appendix H, *Noise and Vibration Impact Assessment*, includes the equations and data used for calculating wayside and locomotive horn noise levels. Figures H-1 through H-79 in Appendix H show the 65 DNL and 3 dBA increase contours for the rail segments that have sensitive receptors in the study area. OEA calculated the 3 dBA increase contours using the ambient sound measurements listed in Table 7-1 to characterize the existing noise conditions. The area within the 3 dBA increase contour can be quite large if the ambient sound level is sufficiently low.

Noise-Sensitive Receptors

OEA used GIS software that included digital aerial imagery to count receptors, as described in Section 7.3.2, *Noise-Sensitive Receptors*. Table 7-7 presents the receptor counts within the noise contours and noise impacts by build alternative.

Table 7-7. Noise Receptors within the Study Area Noise Contours

	Noise Receptors with ≥ 65 dBA DNL and Increase of ≥ 3 dBA			
	Production Scenario			
Build Alternative	**Low**	**Medium**	**High[b]**	**Noise Receptors with < 65 dBA DNL and Increase of ≥ 3 dBA [a]**
Tongue River	1	1	5	95
Tongue River East	0	0	1	56
Colstrip (Colstrip Subdivision)	1 (34)	1 (65)	5 (89)	1,040
Colstrip East (Colstrip Subdivision)	0 (34)	0 (63)	0 (84)	1,007
Tongue River Road	1	2	5	106
Tongue River Road East	0	1	1	64
Moon Creek	1	1	5	76
Moon Creek East	0	0	1	37
Decker	0	0	1	39
Decker East	0	0	0	27

Notes:
[a] ≥ 3 dBA contours are based on rail traffic under the high production scenario
[b] low and medium receptor counts are included in the high receptor counts
DNL = day-night average sound level; dBA = A-weighted decibels

Based on the Board's thresholds, an adverse noise impact resulting from railroad operation would occur if noise levels from rail operation meets or exceed 65 DNL and increase by at least 3 dBA DNL. Table 7-7 shows that one or more locations under any build alternative, except Decker East, would experience an adverse noise impact due to rail operation under the high productions scenario. The Colstrip Alternative would have the most receptors with an adverse noise impact because there is a higher density of receptors close to the proposed rail line. Most of these receptors are adjacent to the existing Colstrip Subdivision. Approximately three trains per day[10] operate on the existing Colstrip Subdivision, but the noise levels for this section of rail would increase substantially on a DNL basis because of

[10] Based on FRA information. As many as 22 (19 + 3) train passbys per day were modeled on the existing Colstrip Subdivision.

the increased rail traffic. All of the receptors that would experience an adverse noise impact are residences.

Figures 7-2 through 7-11 show noise contours and adversely impacted receptors for the low, medium, and high production scenarios. Noise contours for the entire project area are included in Appendix H, *Noise and Vibration Impact Assessment*.

Vibration

Building Damage

Based on the maximum train speed of 40 miles per hour and assuming a *crest factor* (the ratio between average and peak vibration levels) of 4,[11] the building damage contour for the FTA fragile building damage criterion of 0.20 inch per second would be 10 feet wide (5 feet on each side of the track centerline). No buildings would be within 5 feet of the any build alternative. Therefore, no damage to buildings due to vibration from rail line operation is expected.

Vibration Annoyance

The vibration annoyance contour along the proposed rail line, using the FTA infrequent event (less than 30 trains per day) criterion of 80 VdB[12] (Federal Transit Administration 2006), would be 80 feet from the track centerline. No receptors would be within 80 feet of any build alternative. Therefore, vibration levels due to train operation would be lower than FTA's infrequent event criterion of 80 VdB.

With respect to the existing Colstrip Subdivision, no changes in vibration levels are expected relative to the existing rail traffic on this line. Vibration impacts are evaluated on the basis of maximum vibration level alone (i.e., not on the basis of number of trains per day as long as total rail operation is below FTA's infrequent event threshold of 30 trains per day), and no exceedances of FTA vibration criteria are expected.

[11] FTA recommends a crest factor of 4 to 5 for ground-borne vibration analysis of trains.

[12] FTA defines "infrequent events" as 30 or less vibration events per day, "occasional events" as between 30 and 70 events per day, and "frequent events" as more than 70 events per day. FTA's human annoyance criterion for residences is 80 VdB for infrequent events, 75 VdB for occasional events, and 72 VdB for frequent events.

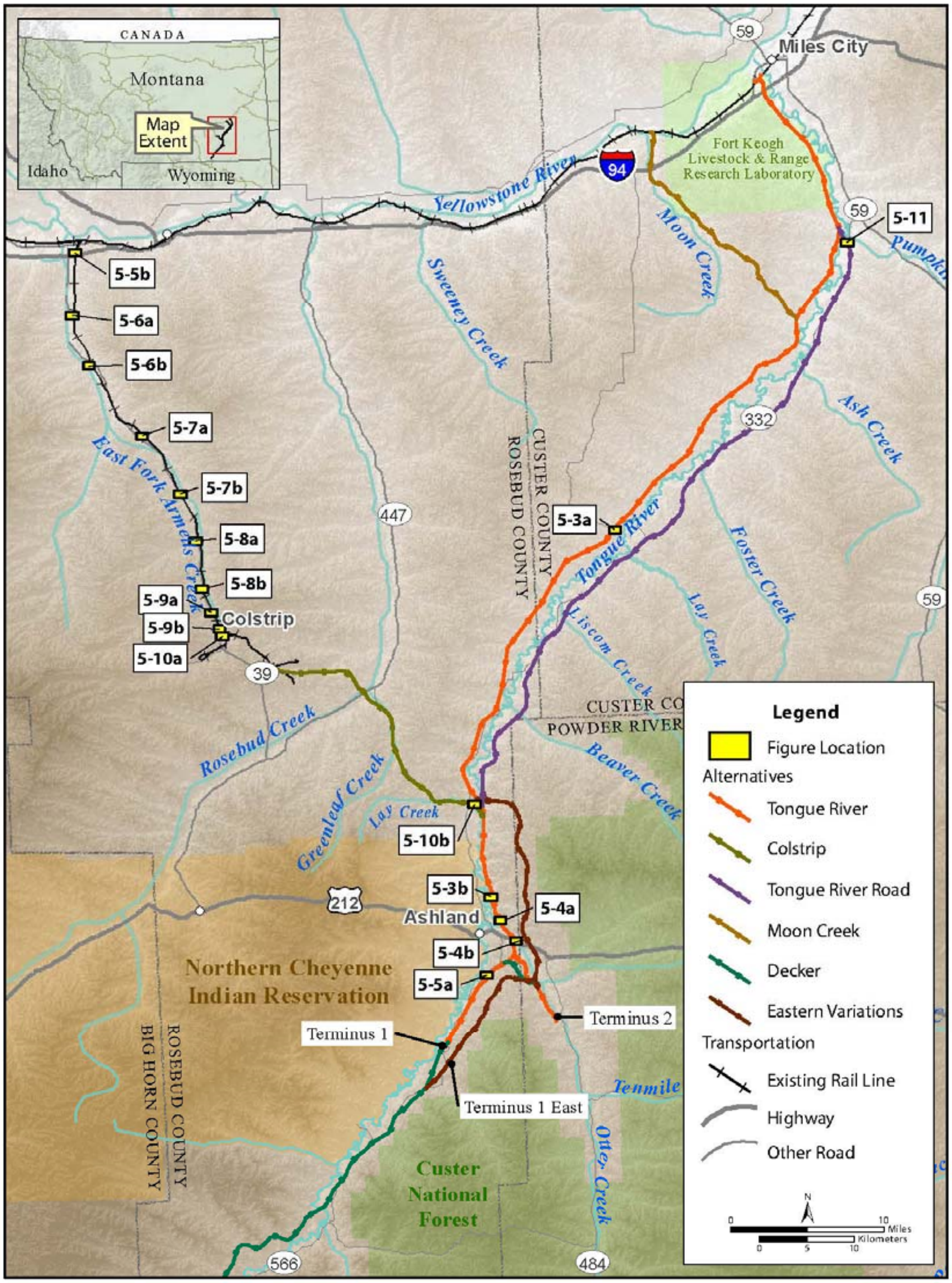


Figure 7-2. Figure Locations for the Noise Contours and Receptors

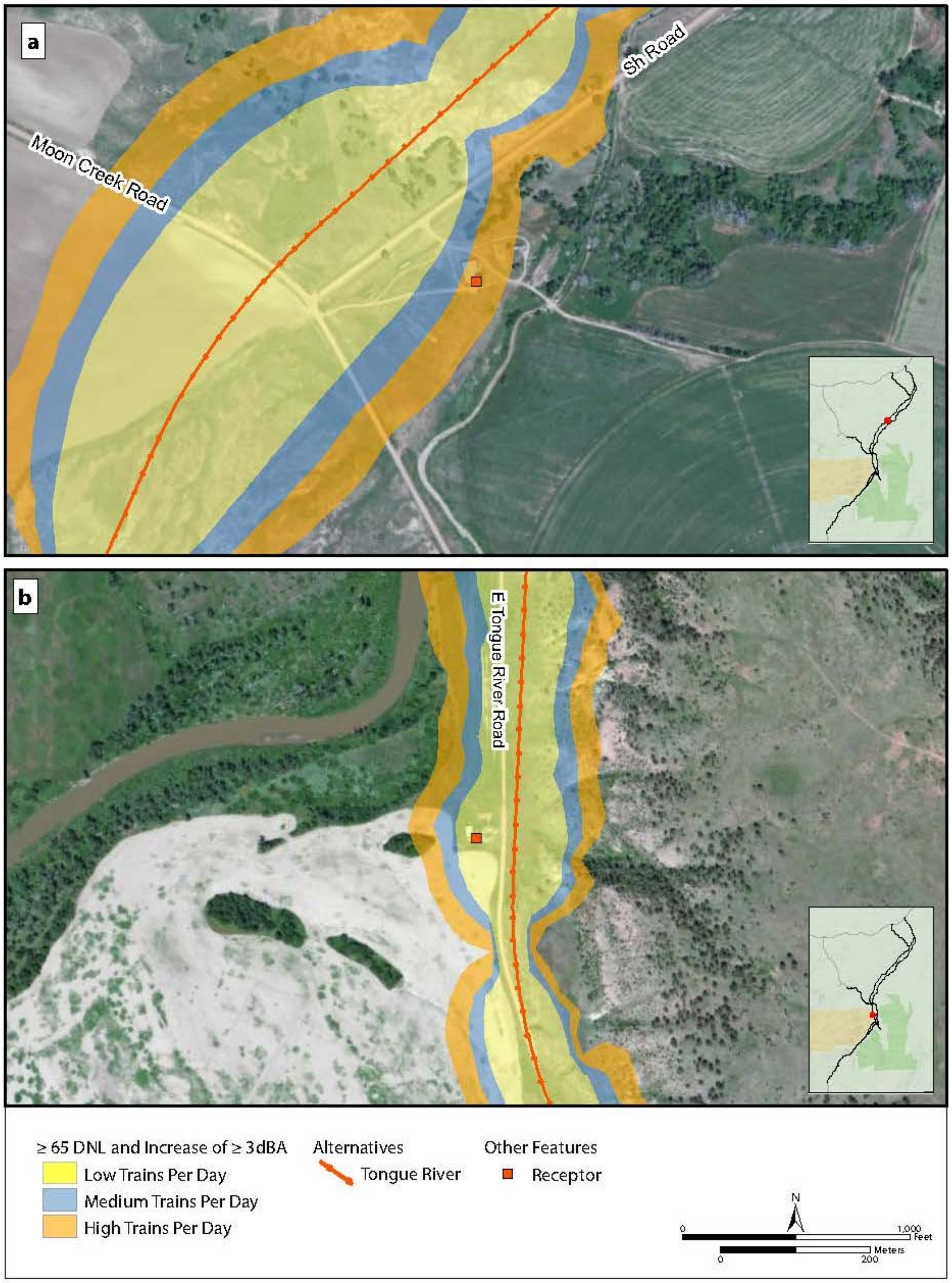


Figure 7-3. Noise Contours and Receptors

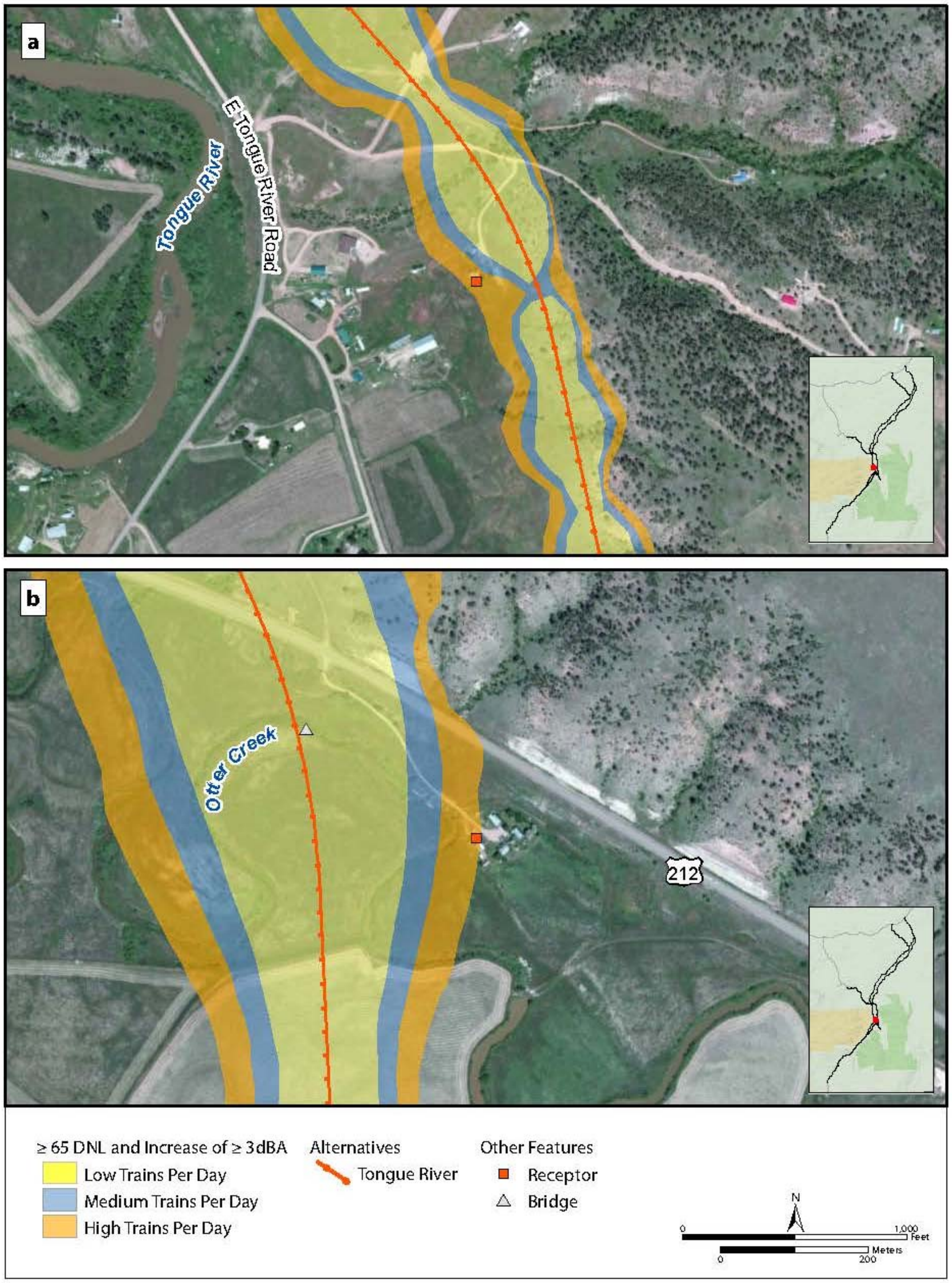


Figure 7-4. Noise Contours and Receptors

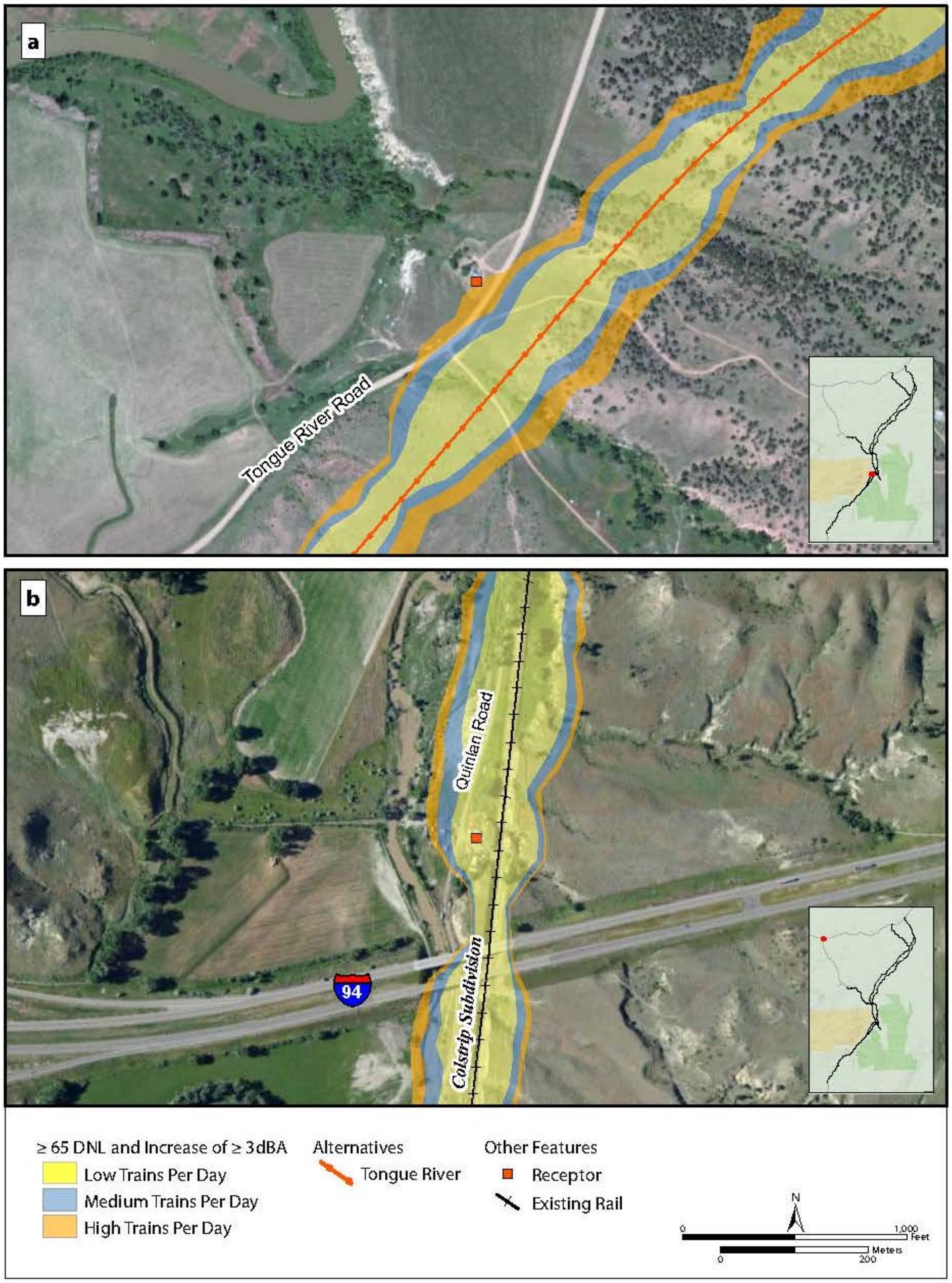


Figure 7-5. Noise Contours and Receptors

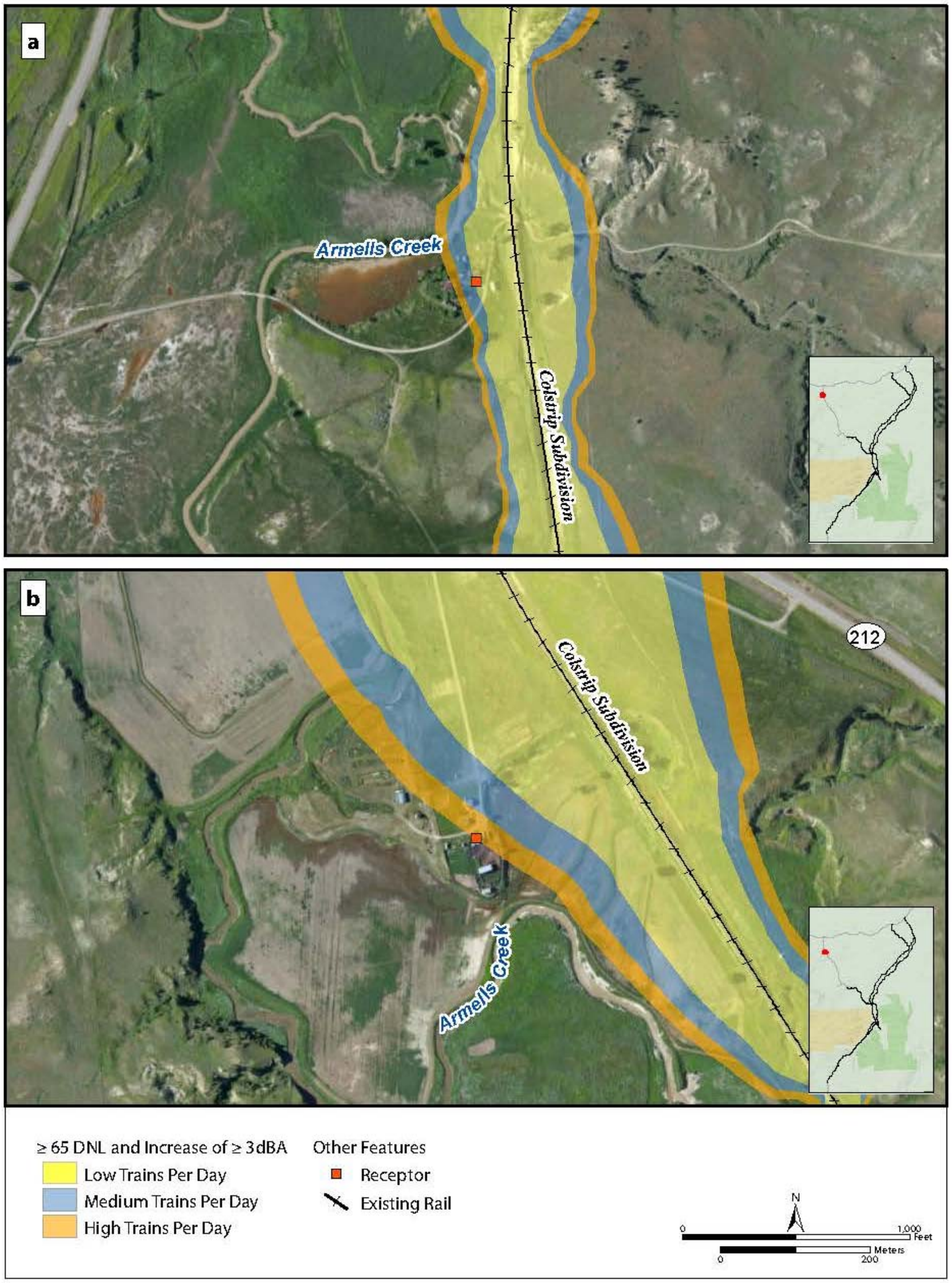


Figure 7-6. Noise Contours and Receptors

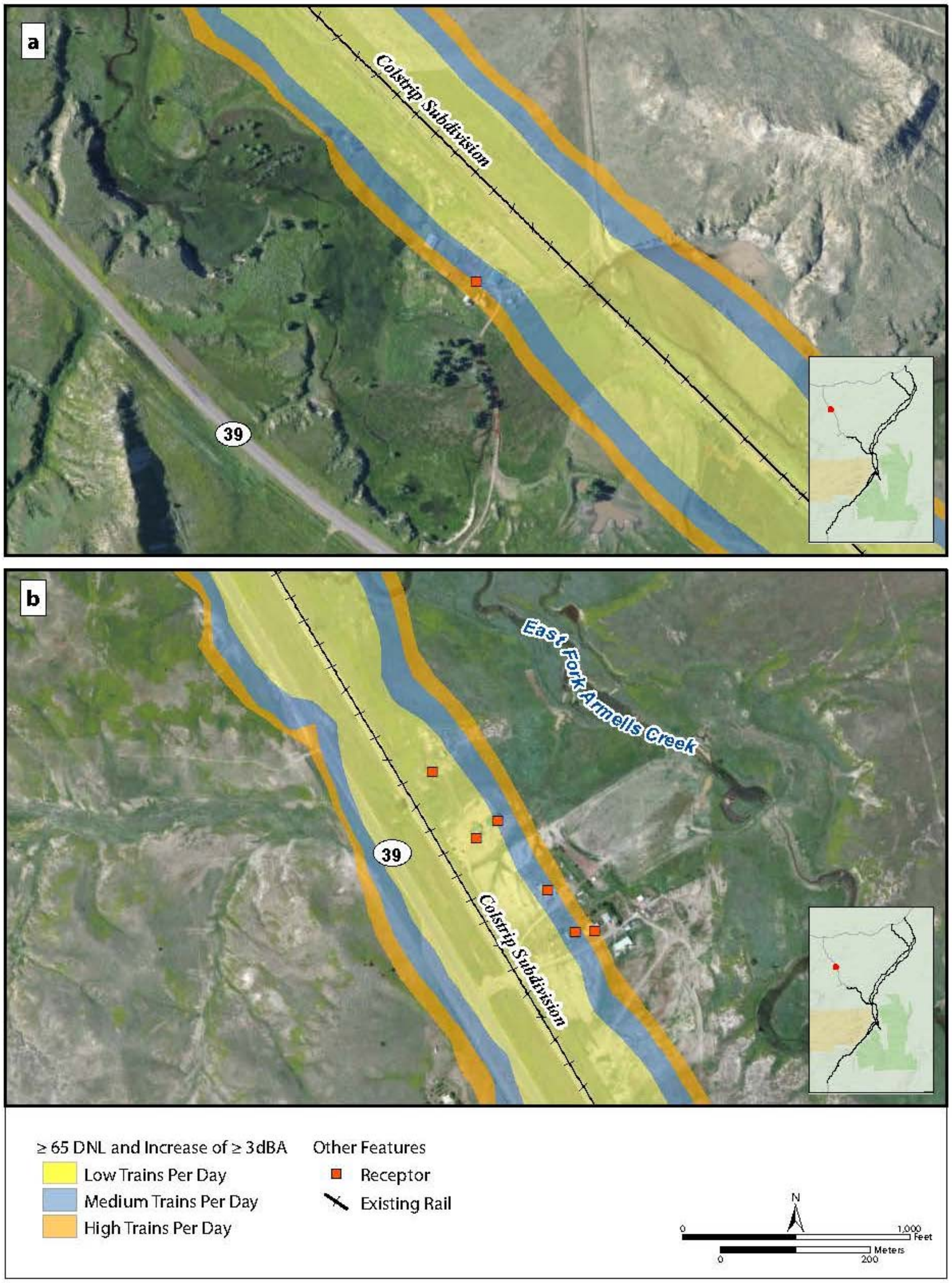


Figure 7-7. Noise Contours and Receptors

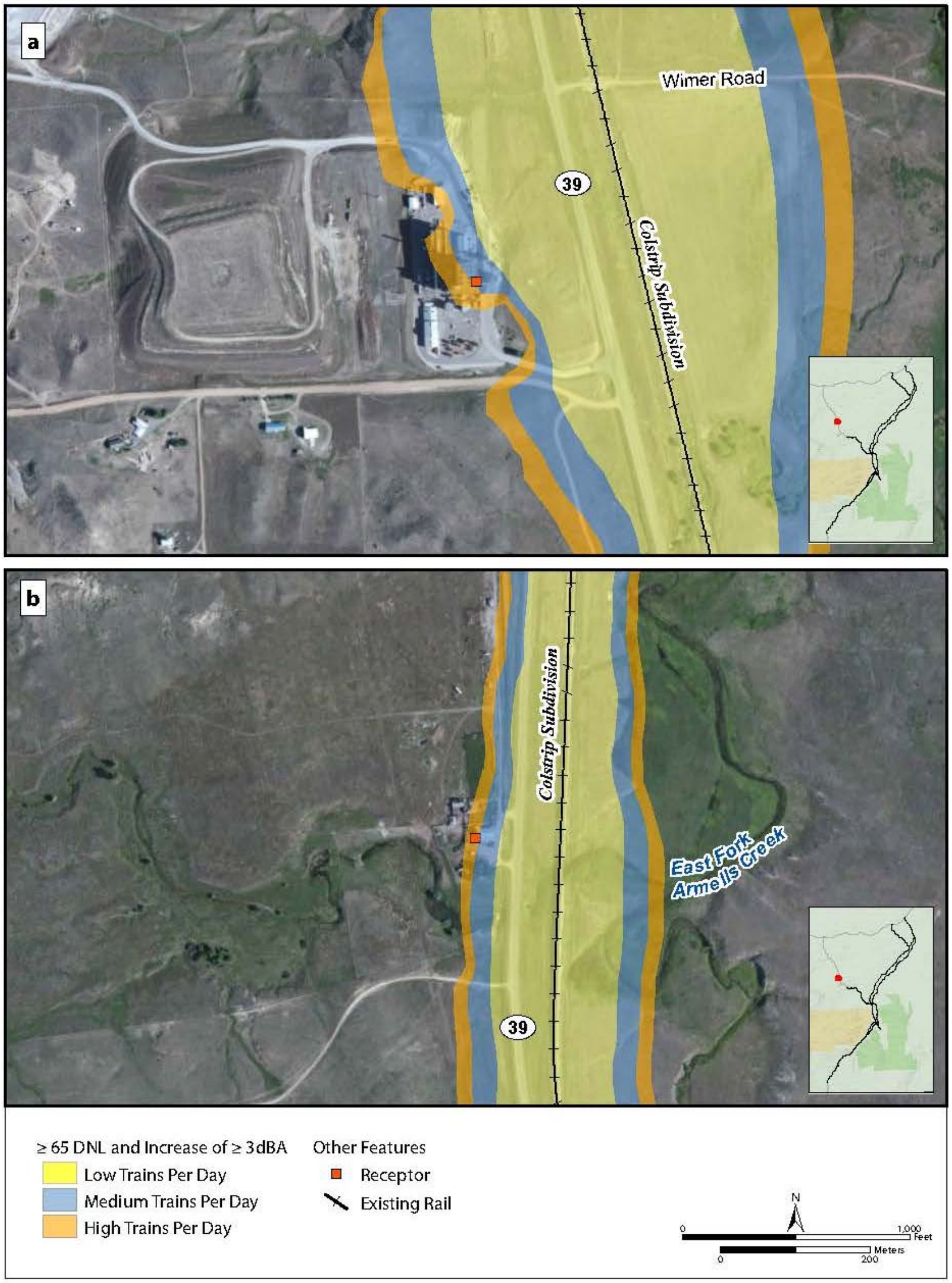


Figure 7-8. Noise Contours and Receptors

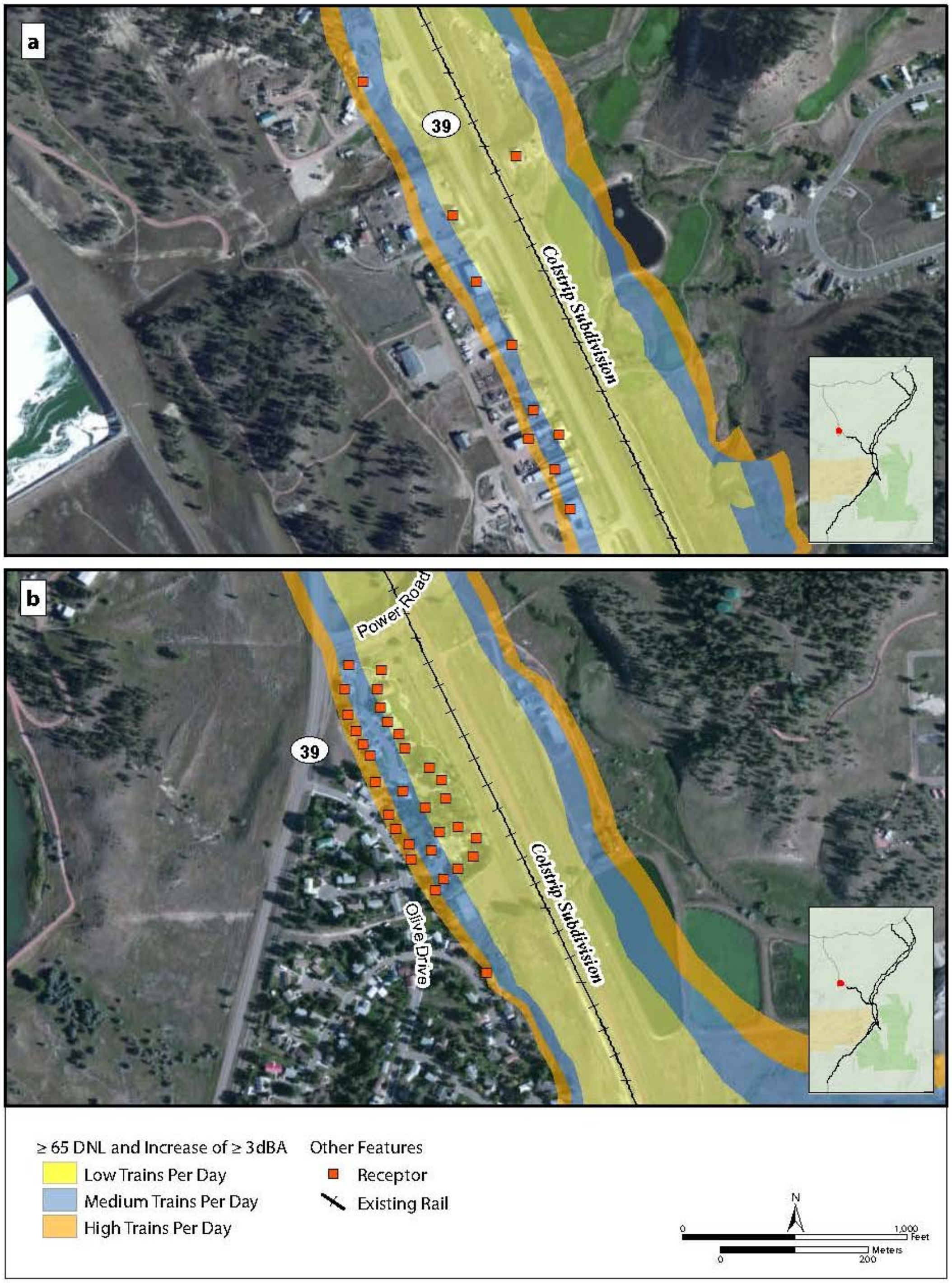


Figure 7-9. Noise Contours and Receptors

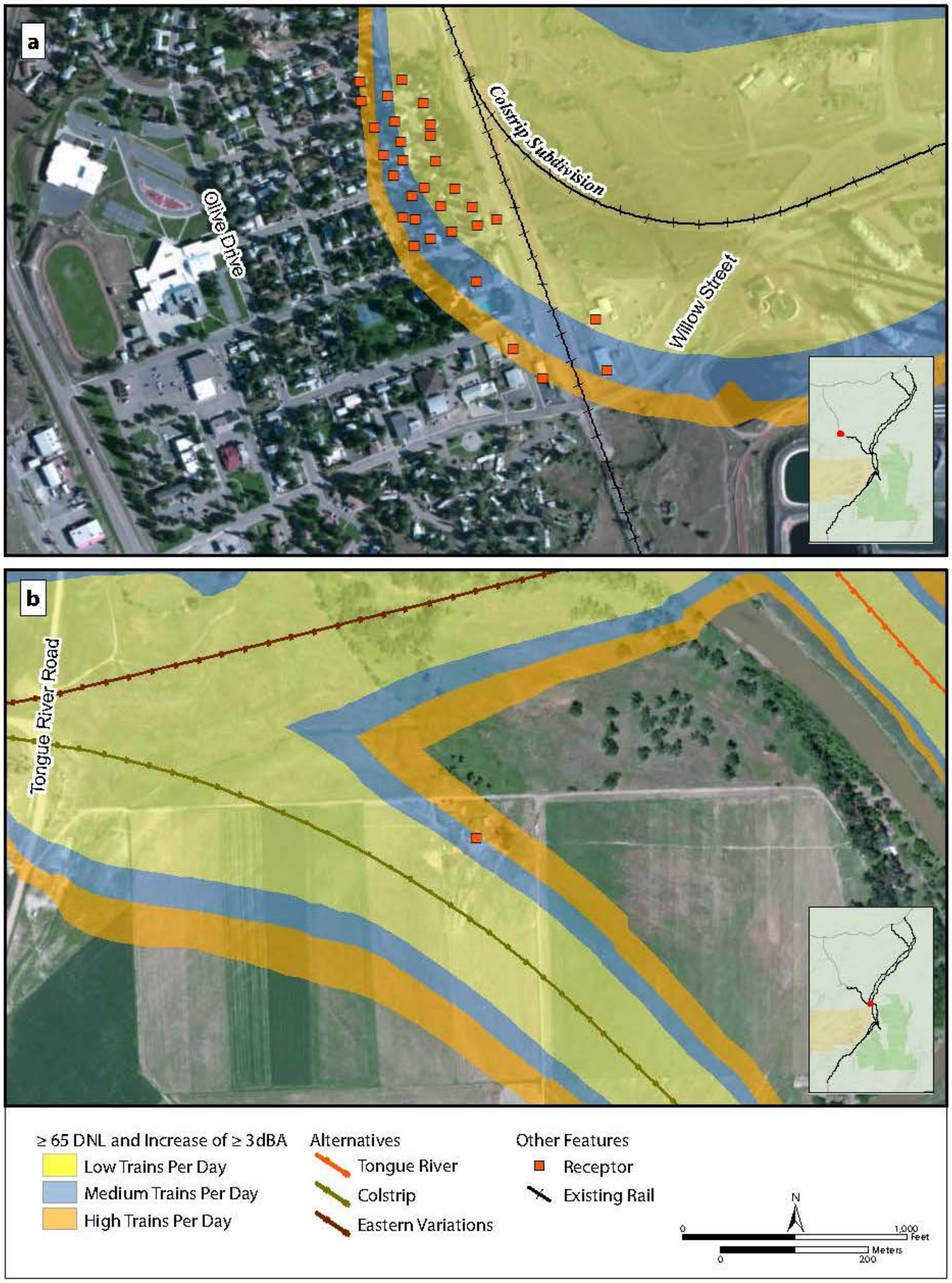


Figure 7-10. Noise Contours and Receptors

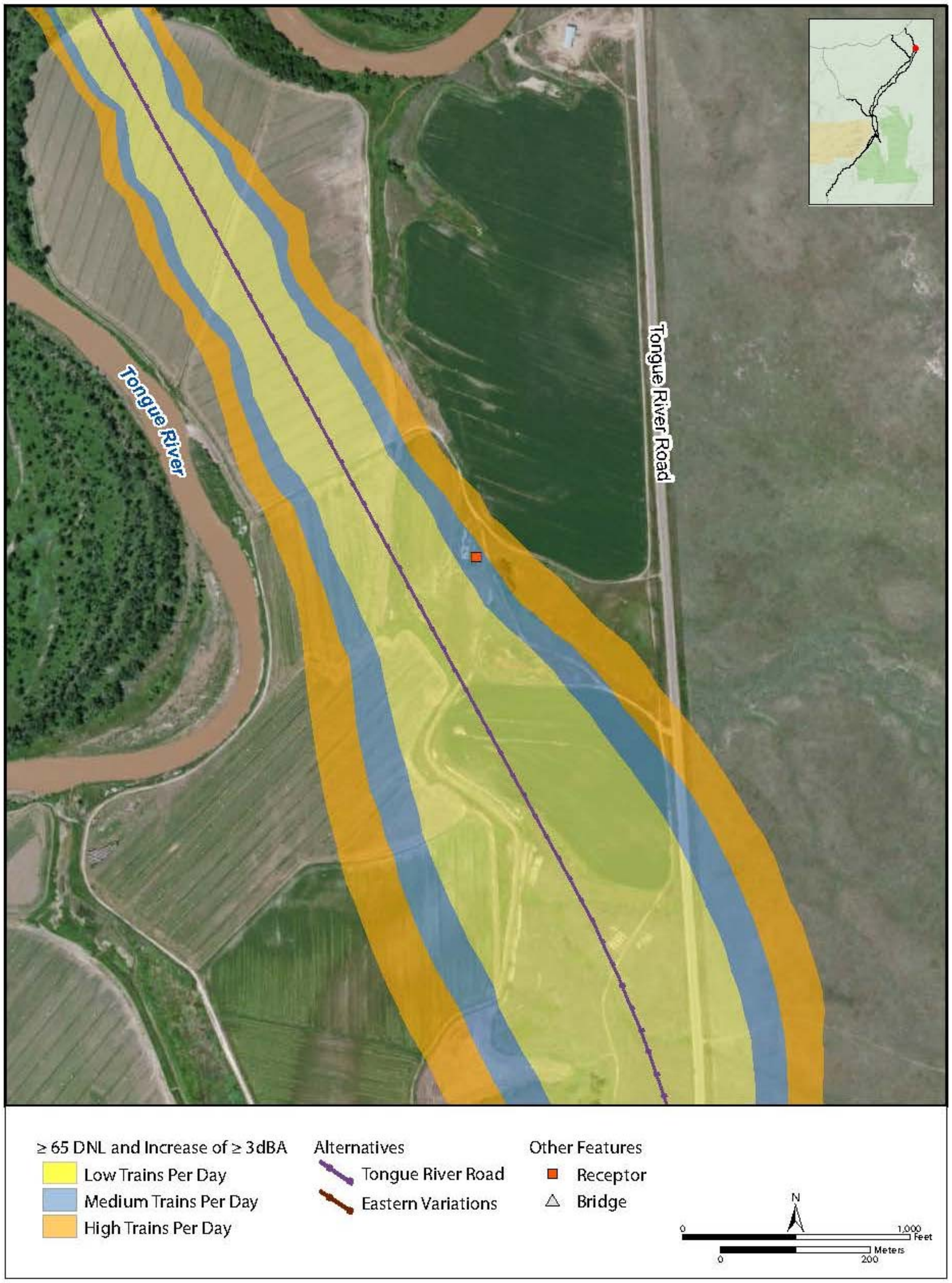


Figure 7-11. Noise Contours and Receptors

7.5.2 No-Action Alternative

Under the No-Action Alternative, TRRC would not construct and operate the proposed Tongue River Railroad, and there would be no adverse noise or vibration impacts from construction or operation of the proposed rail line.

7.5.3 Mitigation and Unavoidable Adverse Impacts

To avoid or minimize the potential environmental impacts from noise and vibration during construction of the proposed rail line, OEA is recommending that the Board impose four construction-related mitigation measures, including two measures volunteered by TRRC (Chapter 19, Section 19.2.4, *Noise and Vibration*). These measures would require TRRC to develop a construction noise and vibration plan, minimize construction-related noise in residential areas, minimize construction-related noise in general, and consult with officials of schools near the project area to consider alternate construction schedules. OEA is also recommending that the Board impose six operation-related mitigation measures (Chapter 19, Section 19.2.4, *Noise and Vibration*) at locations where receptors would experience operation noise levels at 65 DNL or greater and an increase of 3 dBA or greater. These measures would require TRRC to employ mitigation at receptors where operation would exceed the Board's regulatory threshold for analyzing noise impacts, consult with communities along the Colstrip Subdivision in the establishment of quiet zones, install a rail lubrication system, comply with federal noise limits, maintain rail cars in good working order, and maintain the rail and rail bed.

OEA has estimated future rail traffic (Chapter 2, Section 2.3.3, *Rail Traffic*); however, actual levels are unknown at this time. Therefore, OEA is recommending that the Board require TRRC to monitor rail traffic volumes on the new line and employ mitigation for OEA-identified receptors that experience at least 65 DNL/+3 dBA corresponding with the 7, 12, and 19 trains per day for the low, medium, and high production scenarios if and when they materialize. OEA is recommending a noise mitigation goal of a noise reduction of 10 dBA with a minimum actual reduction of 5 dBA (Chapter 19, Section 19.2.4, *Noise and Vibration*).[13] Because the number of receptors that would be adversely affected (at 65 DNL/+3 dBA) is relatively small (five or fewer for areas with new track), the cost of mitigation for these receptors would be reasonable within the context of the overall rail project cost. Impacts that remain after mitigation would be negligible Appendix H, *Noise and Vibration Impact Assessment*, provides more detail on noise mitigation and noise mitigation feasibility and reasonableness.

OEA is not recommending mitigation measures for noise impacts from rail line operation for the existing Colstrip Subdivision because rail traffic on existing lines fluctuates over time, the rail line predates nearby residences, and the history of noise regulation for interstate

[13] These noise mitigation goals are typical best practices for agencies involved in transportation noise mitigation. These values are typical for both residential sound insulation projects as well as transportation noise barrier projects.

commerce is to regulate noise at the source. However, OEA analyzed the feasibility of potential quiet zones[14] along the existing Colstrip Subdivision. This analysis revealed specific grade crossings where substantial noise reduction at receptors could be realized if a quiet zone were implemented. OEA is recommending that the Board require that a designated community liaison consult with the community along the existing Colstrip Subdivision with regard to establishing quiet zones at certain grade crossings where FRA safety standards could be met. Appendix H, *Noise and Vibration Impact Assessment*, provides detailed information on potential quiet zones along this rail segment.

Even with the implementation of OEA's recommended mitigation measures and TRRC's voluntary measures, construction of the proposed rail line could cause unavoidable noise and vibration impacts from construction equipment and pile driving for bridges, if required. OEA considers these adverse impacts to be moderate but temporary in nature. Operation of the proposed rail line could also cause unavoidable noise impacts along the existing Colstrip Subdivision where quiet zones are not feasible or reasonable. Given that there are many receptors along this line at locations where thresholds are exceeded and quiet zones are not feasible or reasonable for all such receptors, OEA considers these adverse impacts. In addition, noise levels would increase because increased wayside noise would result from increased rail traffic.

7.6 Applicable Regulations

Different federal, state, and local jurisdictions are responsible for the regulation of noise and vibration. These entities and the regulations and guidance related to noise and vibration are summarized in Table 7-8.

[14] Quiet zones can be established by local authorities to limit the sounding of rail horns at rail/highway crossings to emergencies and situations in compliance with railway policies or federal regulations. In order to establish a quiet zone, the local authorities must mitigate the risks of not sounding the horn.

Table 7-8. Regulations and Guidance Related to Noise and Vibration

Regulation	Explanation
Federal	
National Environmental Policy Act (42 U.S.C. § 4321 *et seq.*)	Requires the consideration of potential environmental effects, including potential effects of (or on) contaminated sites in the environmental impact statement for any proposed major federal agency action. NEPA implementation procedures are set forth in the President's Council on Environmental Quality's Regulations for Implementing NEPA (40 C.F.R. Part 1500).
Surface Transportation Board regulations (49 C.F.R. Part 1105.7)	Sets two thresholds for noise analysis: An increase in noise exposure as measured by a DNL of 3 dBA) or more and an increase to a noise level of 65 DNL or more.
Noise Control Act of 1972 (42 U.S.C. § 4910)	Protects the health and welfare of U.S. citizens from the growing risk of noise pollution, primarily from transportation vehicles, machinery, and other commerce products. Amended the Federal Aviation Act to involve the USEPA in airport noise regulation. Increased coordination between federal researchers and noise control activities; established noise emission standards; and presented noise emission and reduction information to the public (U.S. Environmental Protection Agency 2014a).
Federal Transit Administration Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06, May 2006)	Provides procedures and guidance for analyzing the level of noise and vibration, assessing the resulting impacts, and determining possible mitigation for most federally funded transit projects (Federal Transit Administration 2006).
Federal Railroad Administration High-Speed Ground Transportation Noise and Vibration Impact Assessment (October 2005)	Provides guidance and methods for "the assessment of potential noise and vibration impacts resulting from proposed high-speed ground transportation projects" (Federal Railroad Administration 2012). Intended for trains ranging from 90 to 250 mph.
Occupational Safety and Health Administration, Occupational Noise Exposure Hearing Conservation Amendment (29 C.F.R. Part 1910.95)	Sets duration limits for workers exposed to certain levels of sound. Mitigation measures are required when the permissible noise exposure limits are exceeded. Employers must take preventative measures such as hearing conservation programs, monitoring, or employee notification when an 8-hour time-weighted average of 85 dBA (referred to as the action level) occurs.
USEPA Railroad Noise Emission Standards (40 C.F.R. Part 201)	Established "final noise emission standards for surface carriers engaged in interstate commerce by railroad." This rulemaking is pursuant to Section 17 of the Noise Control Act of 1972 (U.S. Environmental Protection Agency 2014b).
FRA Railroad Noise Emission Compliance Regulations (49 C.F.R. Part 210)	These regulations indicate the minimum compliance regulations necessary to enforce USEPA's Railroad Noise Emission Standards.
FRA Final Rule on the Use of Locomotive Horns at Highway-Rail Grade Crossings (49 C.F.R. Part s 222 and 229)	Requires the sounding of locomotive horns at public highway rail grade crossings. Considers the allowance of "quiet zones" when the increase risk is mitigated with supplementary grade crossing safety measures.
State and Local	
No state and local regulations apply. Freight railroads are exempt from state and local noise ordinances so as not to impede interstate commerce (Interstate Commerce Act and "Joint Petition for Declaratory Order- Boston and Maine Corporation and the Town of Ayer, MA (STB Finance Docket No. 33971, May 1, 2001).	

Notes:
U.S.C. = United States Code; NEPA = National Environmental Policy Act; C.F.R. = Code of Federal Regulations; DNL = day-night average noise level; dBA = A-weighted decibels; USEPA = U.S. Environmental Protection Agency; FTA = Federal Transit Administration; FRA = Federal Railroad Administration